Name: _____ **Date:** _____

Math 10F&PC Chapter 2 Trigonometry

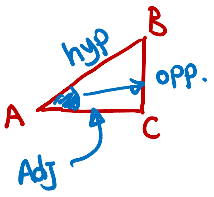
2.4 The Sine and Cosine Ratios

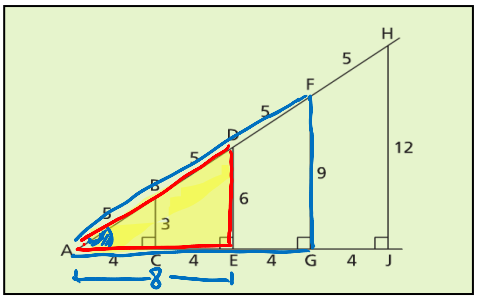
Focus: Develop and apply the sine and cosine ratios to determine angle measures.

Activity: Try This:

Calculate the length of AB, and complete the table.

$c^2 = a^2 + b^2$





B. Complete this table.

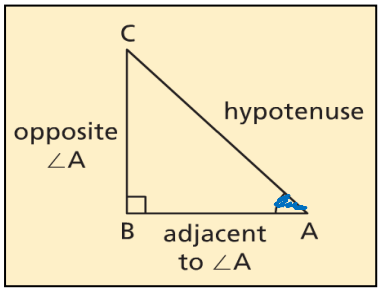
Triangle	Measures of Sides			Ratios	
	Hypotenuse	Side opposite ∠A	Side adjacent to ∠A	Side opposite ∠A / Hypotenuse	Side adjacent to ∠A / Hypotenuse
△ABC	5	3	4	$\frac{opp}{hyp} = \frac{3}{5} = 0.6$	$\frac{Adj}{hyp} = \frac{4}{5} = 0.8$
△ADE	10	6	8	$\frac{opp}{hyp} = \frac{6}{10} = 0.6$	$\frac{Adj}{hyp} = \frac{8}{10} = 0.8$
△AFG	15	9	12	$= \frac{9}{15} = 0.6$	$= \frac{12}{15} = 0.8$
△AHJ	20	12	16	$= \frac{12}{20} = 0.6$	$= \frac{16}{20} = 0.8$

- How do the ratios compare? they are equal
- What do you think the value of each ratio depends on? Angle A ∠A

In a right triangle, the ratios that relate each leg to the hypotenuse depend only on the measure of the Acute Angle, and not on the size of the triangle. These ratios are called the $\frac{opp}{hyp}$ = sin ratio and the $\frac{Adj}{hyp}$ = cos ratio.

$\tan\angle\theta = \frac{opp}{Adj}$

The Sine and Cosine Ratio:



If ∠A is an acute angle in a right triangle, then

$\sin A = \frac{\text{the length of the opposite side}}{\text{the length of the hypotenuse}}$ $\sin A = \frac{opp.}{hyp}$

$\cos A = \frac{\text{the length of the Adjacent side}}{\text{the length of the hypotenuse}}$ $\cos A = \frac{Adj}{hyp}$

$\sin = \frac{opp}{hyp}$ $\cos = \frac{Adj}{hyp}$ $\tan = \frac{opp}{Adj}$

In Short SOH CAH TOA

Lets Find each missing angle. Write the inverse step

tan A = 1.287 — $\angle A = \tan^{-1}(1.287)$, $\angle A = 52^\circ$

cos A = .251 — $\angle A = \cos^{-1} 0.251$, $\angle A = 75^\circ$

sin A = .493 — $\angle A = \sin^{-1} 0.493$, $\angle A = 30^\circ$

tan A = 0.34 — $\angle A = \tan^{-1} 0.34$, $\angle A = 19^\circ$

$\sin A = \frac{1}{3}$ — $\angle A = 19^\circ$

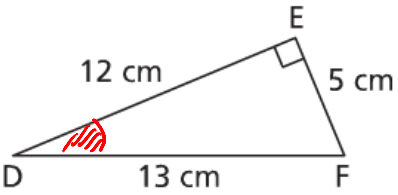
$\cos A = \frac{\sqrt{3}}{2}$ — $\angle A = 30^\circ$

$\tan A = \frac{12}{5}$ — $\angle A = 67^\circ$

$\cos A = \frac{4}{3}$ — $\angle A =$ Not defind because the Adj. side can not be bigger than hypotenuse.

Example1: Determining the Sine and Cosine of an Angle.

a) In △DEF, identify the side opposite ∠D and the side adjacent to D.



$\angle D$ ← opp = 5 cm, Adj = 12 cm; hyp = 13 cm

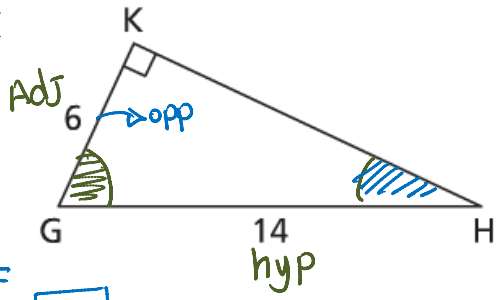
b) Determine ***sin D*** and ***cos D*** to the nearest hundredth.

$\sin D = \frac{opp}{hyp} = \frac{5}{13}$

$\cos D = \frac{Adj}{hyp} = \frac{12}{13}$

Lets calculate $\angle D$: $\sin^{-1}(\frac{5}{13}) = 22.6^\circ$, $\cos^{-1}(\frac{12}{13}) = 22.6^\circ$

Example2: Determine the measures of ∠G and ∠H to the nearest tenth of a degree.



$\angle G \Rightarrow \cos G = \frac{Adj}{hyp} = \frac{6}{14}$

$\angle G = \cos^{-1}(\frac{6}{14}) = 64.6^\circ \doteq 65^\circ$

$\angle H \Rightarrow \sin H = \frac{opp}{hyp} = \frac{6}{14}$ $\angle H = \sin^{-1}(\frac{6}{14}) =$

$\angle H = 25.3 \doteq 25$

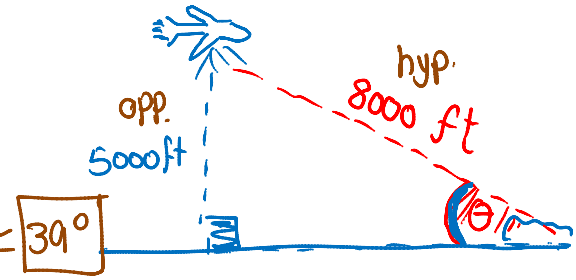
Example3: ***Using Sine or Cosine to Solve a Problem.***

A water bomber is flying at an altitude of 5000 ft. The plane's radar shows that it is 8000 ft. From the target site. What is the ***angle of elevation*** *of the plane measured from the target site, to the nearest degree?*

The angle of elevation of an object above the horizontal is the angle between the horizontal and the line of sight from an observer.

$\sin\theta = \frac{opp}{hyp} = \frac{5000}{8000} = \frac{5}{8}$

$\angle\theta$ = angle of Elevation = $= \sin^{-1}(\frac{5}{8}) = 38.67 \simeq 39^\circ$



Assignment: p. 95 #4, 7 – 10 (a, c, e), 12, 14, 15, 18

Quiz 2.1 – 2.4
Wed. Oct. 24